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Proceedings of the Regional Peer Review Meeting on the Assessment of the Estuary and Northern Gulf of St. Lawrence Snow Crab Stocks

February 16 and 17, 2016
Mont-Joli, Quebec

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

This document contains the proceeding from the meeting held within the regional assessment process on Snow crab in the Estuary and Northern Gulf of St. Lawrence. This review process was held on February 16th and 17th, 2016 at the Maurice Lamontagne Institute in Mont-Joli. This meeting gathered about fifty participants from science, management and industry. These proceedings contain the essential parts of the presentations and discussions held, and report the recommendations and conclusions that were presented during the review.

SOMMAIRE

Ce document renferme le compte rendu de la réunion tenue dans le cadre du processus régional d'évaluation des stocks de crabe des neiges de l'estuaire et du nord du golfe du Saint-Laurent. Cette revue, qui a eu lieu les 16 et 17 février 2016 à l'Institut Maurice-Lamontagne à Mont-Joli, a réuni une cinquantaine de participants des sciences, de la gestion et de l'industrie. Ce compte rendu contient l'essentiel des présentations et des discussions qui ont eu lieu pendant la réunion et fait état des recommandations et conclusions émises au moment de la revue.

INTRODUCTION

The Quebec Region of the Department of Fisheries and Oceans (DFO) is responsible for assessing the stocks of several exploited fish and invertebrate species in the Estuary and Gulf of St. Lawrence. Most of these stocks are assessed periodically within a regional advisory process, which is conducted at the Maurice Lamontagne Institute in Mont-Joli. This document consists of the proceedings of the meeting held on February 16 and 17, 2016, on the assessment of the Estuary and Northern Gulf of St. Lawrence Snow Crab stock.

The objective of the review was to determine whether there were any changes in the resource's status and whether adjustments were required to the management plans based on the chosen conservation approach. The ultimate goal was to provide scientific advice on managing the Snow Crab stock in the Estuary and Northern Gulf of St. Lawrence for the 2016 fishing season.

These proceedings report on the main points discussed in the presentations and deliberations stemming from the activities of the regional stock assessment committee. The regional review is a process open to all participants who are able to provide a critical outlook on the status of the assessed resources. Accordingly, participants from outside DFO are invited to take part in the committee's activities within the defined framework for this review (Appendices 1 and 2). The proceedings also list the recommendations made by the meeting participants.

BACKGROUND

The meeting chairperson, Denis Chabot, summarizes the peer review objectives and process. He presents the agenda and the Terms of Reference for the meeting. Assessing biologist Jean Lambert highlights the contributions made by his collaborators. He presents an overview of landings on the Atlantic Coast as a whole and by fishing area (12A, 12B, 12C, 13, 14, 15, 16, 16A and 17). In 2015, landings totalled 8,554 t. Area 16 contributes the largest share of landings.

The conservation principle that applies to these areas targets the protection of reproductive potential. Management measures include limits imposed on catches via a total allowable catch (TAC), effort controls (number of traps, number of licenses and fishing season) and a minimum legal carapace size set at 95 mm. In addition, the fishery is closed when catches in one area include more than 20% white crab.

The data used in the assessment are mainly from the fishery (ZIFF and logbooks, commercial sampling) and independent sources (post-season survey, trawl survey). These data provide the key stock status indicators, including the commercial catch per unit effort (CPUE), post-season number per unit effort (NPUE), combined CPUE and NPUE index, carapace condition at landing, prospects for recruits/adolescents and crab left by the fishery, distribution of fishing effort, average size and size frequency.

Mr. Lambert then briefly describes the species biology and defines the various carapace conditions and crab categories mentioned in the review. Categories 1 and 2 are recruits, and categories 3 to 5 are crabs left by the fishery. Mr. Lambert states that the combined index is based on the average of both commercial biomass indices (standardized CPUE from the commercial fishery and NPUE of adults ≥ 95 mm in the post-season survey).

Before getting into the details of the assessment, area by area, a few environmental considerations are introduced, including the minimum temperature of the CIL and the preferred temperatures at different life stages.

- Considering the warming observed of the deep water of the Gulf of St. Lawrence, a reduction in the range of preferred habitat of the Snow Crab is anticipated.
- Participants find that it would be interesting to obtain bottom temperature maps to better assess the range of preferred habitat: 0 to 2 degrees for the benthic stage and below 3–4 degrees for large crabs.

ASSESSMENT OF THE RESOURCE

Mr. Lambert reviews the key indicators for each fishing area. Participants ask questions and make comments. A summary is presented as well as the text of three harvest scenarios and their potential impact on the biomass. In this meeting, participants must agree on the wording of all three scenarios (intensive, intermediate, careful). The preferred option will be discussed at the Advisory Committee meeting. It is explained that this approach was implemented last year in response to a request made by the highest departmental authorities.

AREA 16

Indicators: Area 16

The TAC decreased by 25% to 4145 t between 2014 and 2015 and was reached. The catch rate for the commercial fishery remained stable in 2015 and is well above average. Landings, which consisted primarily of recruits from 2006 to 2014, contained a slight majority of intermediate-shell crabs in 2015.

The post-season survey suggests that the biomass available to the fishery will be slightly higher in 2016 than 2015 due to a high abundance of recruits that offset the decrease in crab left by the fishery. The combined index of commercial CPUE and of NPUE from the post-season survey slightly increased and remains high, suggesting that the biomass available to the fishery in 2016 will be slightly higher than in 2015.

The trawl survey conducted in the western part of the area and the post-season survey indicate an increase in the abundance of adolescents ≥ 78 mm in 2015. Conversely, the trawl survey results suggest that recruitment will decline in the medium term.

Participants make some comments:

- Participants from the industry report that larger crabs have been observed at shallower depths. The Science representatives believe this could be related to the resource moving due to the warming of deep waters or to a late moult making larger crabs inaccessible in deeper water.
- The trawl survey suggests a decrease in recruitment in the medium term in the west part of Area 16. However, a fairly large new cohort (2014 cohort) has apparently been observed and could be available to the fishery in the longer term (7–8 years).

Summary and outlook: Area 16

Participants discuss the summary and scenarios presented:

- Participants suggest adding a highlight to the summary to say that there was a decrease in crabs left by the fishery in the post-season survey.
- Participants seem to be satisfied with the scenarios presented.

Participants accept the following scenarios:

The slight rise in the combined index suggests that it is possible to maintain or slightly increase catches in 2016 compared to 2015:

1) An increase in catches greater than 10% would lead to a high harvesting intensity and could reduce the biomass available to the fishery in 2017.
2) The status quo or an increase of no more than 10% would likely not entail an excessively high harvesting intensity and would mitigate the effects of expected lower recruitment in the medium term.
3) A decrease in catches could help maintain a substantial biomass available to the fishery over a longer period of time.

AREA 12B

Indicators: Area 12B

The TAC decreased by 22% (to 366 t) between 2014 and 2015, and catches were 350 t. The commercial fishery catch rate decreased slightly and was below average. Landings consisted primarily of intermediate-shell crab.

The commercial biomass index of the 2015 post-season survey dropped sharply (69%) from 2014 levels. The temperature increase in the bottom layer of the Laurentian Channel and the thinning of the cold intermediate layer may have caused the crabs to concentrate in shallower waters, including waters shallower than those covered by the post-season survey. It is possible that a greater part of the population than usual was not sampled during the survey.

The post-season survey results suggest there may be a short- or medium-term decrease in recruitment, as also expected in the adjacent areas (16, 16A, and 12C).

Participants ask questions and make comments:

- Based on the analysis of the average catch per trap by depth strata, it is noted that the decrease observed since 2013 is larger at greater depths. Crabs seem to be concentrating in shallower waters in recent years. The industry confirms this; they have had to modify their fishing pattern in the last two years.
- Participants believe this change in distribution is related to the warming of the deep waters of the Laurentian Channel. These are historical temperature records. Warm water is entering through Cabot Strait and making its way to the channels. The Laurentian Channel and Estuary seem to be especially affected.
- Considering this situation, participants wonder how the post-season survey could be changed to better reflect the new situation. It would be advantageous to better cover the shallower strata. Industry participants think that additional resources should be available if we want to increase effort. Some participants suggest using the same effort but distributing it so that it covers shallower strata.
- Participants recommend reviewing the post-season survey protocol. They also suggest collecting temperature data during the post-season survey.
- Participants want the change in fishing pattern to be taken into account in the data (CPUE, size) processing. It should also be noted that this is a small area with few fishers, and that the changes made will have a large influence.
- An industry participant would like to know what the surface temperatures are, although they are not thought to have as much impact on the resource.

- While some participants are concerned about the impact of the return of cod around Anticosti, others believe that crab remains a minor prey species for cod.

Summary and outlook: Area 12B

There are some comments on the summary and scenarios presented:

- The main issue participants raised is whether we are truly comfortable working with data from the post-season survey.
- It is important to add a highlight on the warming of deep waters and the observed changes in crab distribution and the fishing pattern. Note that the data include a great deal of uncertainty.
- In the intermediate scenario, a 10% decrease is proposed. Certain participants say they would be more comfortable with a range of 15 to 20%. The final decision is a decrease of approximately 15%.

Finally, the participants agree on the following scenarios:

The uncertainty linked to the crab's range during the post-season survey provides a rationale for increasing the weighting of the commercial biomass indicator during the fishery (catch per unit effort or CPUE). However, this indicator suggests that 2016 catches should decrease compared to 2015:

1) A decrease in catches less than or equal to 10% could lead to high harvesting intensity.
2) A decrease of approximately 15% could lead to moderate harvesting intensity.
3) A greater decrease could help stabilize the biomass available to the fishery.

AREA 17

Indicators: Area 17

The TAC decreased by 7% to 1342 t between 2014 and 2015 and was reached. The catch rate increased during the 2015 commercial fishery but remained below average. Landings consisted primarily of intermediate-shell crabs.

The commercial biomass index reported in the post-season survey increased due to an increase in the residual biomass. However, it is still below average. The combined index of commercial CPUE and of NPUE from the post-season survey increased, suggesting that the biomass available to the fishery in 2016 will be higher than in 2015. The average size of crabs caught in the commercial fishery is small and is expected to remain small in 2016 according to the post-season survey.

The post-season survey indicates an increase in the abundance of adolescents ≥ 78 mm. These results are consistent with those from the trawl survey and experimental traps, which suggest that a significant number of crabs will reach legal size over at least 3 years starting in 2016. Given the low residual biomass, there is a high risk of observing a large number of white crab in 2016 catches.

Participants make some comments:

- A lot of small individuals have been observed, like in the western part of Area 16, which is very encouraging.

- Generally, participants agree that the indicators presented (fishery and post-season) allow us to be optimistic. According to the fishers, this is a first.

Summary and outlook: Area 17

Participants discuss the summary and scenarios presented:

- In the second scenario, industry members find that a 20% increase is a bit low, considering the increase in the indicators. They are asking for a 25 to 30% increase for this intermediate scenario.
- Other participants remind everyone that the indicators are still below average and low in general.
- An industry participant is of the opinion that it is better to modify the length of the fishing season than catches to ensure conservation of the species.
- Participants decide to maintain a 20% increase in the second scenario and select an increase of 30% or higher in the more intensive scenario.

The participants agree on the following scenarios:

The rise in the combined index suggests a possible increase in catches in 2016 compared to 2015:

1) An increase in catches of 30% or more would lead to a high harvesting intensity, which would slow the expected increase in biomass available to the fishery and increase the risk of catching white crab.
2) An increase of approximately 20% should lead to a moderate harvesting intensity and help increase the biomass available to the fishery.
3) An increase less than 15% could support an even more rapid increase in the biomass available to the fishery and reduce the risk of catching white crab.

AREA 12A

Indicators: Area 12A

The TAC decreased by 20% (to 151 t) between 2014 and 2015, and catches were 132 t. The commercial fishery catch rate decreased in 2015 and is below average. Landings consisted primarily of intermediate-shell crabs.

The commercial biomass index reported in the 2015 post-season survey decreased from 2014 levels due to a decline in residual biomass, with recruitment remaining weak and stable. The combined index of commercial CPUE and NPUE from the post-season survey decreased compared to 2014 and is below average. The biomass available to the fishery will thus be lower in 2016 than in 2015. The average size of crabs caught in the commercial fishery is small and is expected to remain small in 2016 according to the post-season survey.

The post-season survey indicates a decrease in the abundance of adolescent crabs ≥ 78 mm, but to a slightly above-average value.

Participants ask questions and make comments:

- Participants believe that warming did not affect crab distribution in Area 12A in 2015.
- Some participants suggest adding the following research recommendation: reconfirm overflow areas by marking crabs during the post-season survey.

- It is noted that the TAC was not reached for reasons other than resource availability: multi-species fishers (turbot) and conflict with shrimp fishers.

Summary and outlook: Area 12A

Participants make some comments on the summary and scenarios presented:

- It is suggested that the highlight noting the link with adjacent areas be included once again. Although there is local production of new individuals, recruitment in this area also depends on adjacent areas (e.g. Area 17).
- In the intermediate scenario, a 20% decrease is deemed insufficient given the low indicator values. A decrease of approximately 30% would better reflect a moderate harvesting intensity.
- Accordingly, a decrease of 20% or less would be better suited to the first, more intensive, scenario.

Finally, the participants agree on the following scenarios:

The drop in the combined index suggests that 2016 catches should decrease compared to 2015:

1) A decrease of 20% or less in catch levels could lead to high harvesting intensity and a decrease in biomass available to the fishery in 2017.
2) A decrease of approximately 30% should lead to moderate harvesting intensity and help stabilize the biomass available to the fishery.
3) A greater decrease could help increase the biomass available to the fishery in the medium term.

AREA 13

Indicators: Area 13

The TAC increased by 20% to 282 t between 2014 and 2015 and was reached. The commercial fishery catch rate increased between 2014 and 2015 to well above the 1988–2014 average. The fishing effort, which was significantly higher from 2009 to 2014 in the southern than the northern part of Area 13, was slightly higher in the northern than the southern part in 2015. Landings consisted primarily of recruits, whose proportion has been increasing since 2010.

Post-season surveys suggest a slight decrease in the commercial biomass in the northern part of the area, but with levels remaining higher than average, and an increase in the southern part of the area. Based on these surveys, recruitment was high in the northern part and low in the southern part. The combined index of commercial CPUE and of NPUE from the post-season survey achieved its highest value in the series, suggesting that the biomass available to the fishery in 2016 will be higher than in 2015.

The post-season survey in the southern part and the last trawl survey in the northern part indicate a low abundance of adolescents ≥ 78 mm. The post-season survey in the northern part indicates a decrease in adolescents from 2012 to 2014 to stable values slightly below average since 2014. These results suggest that recruitment will be lower in the short to medium term.

The proportion of adult crabs in the population below legal size is falling in the northern part, indicating that crabs are undergoing their terminal moult at larger sizes, which helps increase productivity.

Participants ask questions and make comments:

- It is noted that there seems not to be a connection between the population in the southern part and that in the northern part. Their profiles are entirely different.
- The main discussion is on how to calculate the standardized combined index, which separately takes into account the abundance indicators from the post-season surveys in the northern and southern parts and the fishery. The biologist briefly presents the method used.
- It seems that high values (relative to the average), such as the NPUE in the northern part, create a bias in the combined index value.
- Participants want this approach to be documented, which the biologist says should be done in a research document that the modeller is currently drafting. It is also suggested that the advice specify how different indicators are taken into account in the combined index. The biologist says this was done in the last advice, but points out that this indicator is still under development.
- Participants suggest not setting the reference period and letting it increase. It is also suggested that it be weighted based on the area the survey covers in the north vs the south. It could also be interesting to consider the north and south together when calculating the combined index.
- It is suggested that calculation of the combined index be reviewed before the next meeting on inputs.
- Participants ask about the increase in recruits. Are these "real" recruits or is it because there are more crabs reaching commercial size? They seem to be new cohorts being recruited. However, the proportion of adult crabs reaching legal size also appears to be increasing. It should be possible to confirm this in the coming years with the cohorts born in warmer waters.

Summary and outlook: Area 13

Participants discuss the summary and scenarios presented:

- Participants suggest mentioning in the highlights that although the post-season survey index for the northern part suggests a decrease in the commercial biomass, it remains high.
- It is also important to note that the 2015 value of the combined index is the highest of the series.
- Another fact to mention is that the proportion of legal-size adult crabs has increased.
- Several participants find the scenarios presented to be very careful. In the intermediate scenario, there could be an increase of up to 20% rather than 10%. The more intensive scenario should state "greater than 20%" whereas the more careful scenario should state "a lower increase or the status quo."
- It would be appropriate to include a preamble with background information on how the fishery was reopened in this area in 2008 with a very low TAC, without consideration for the fact that crabs were smaller in this area. In other words, there were crabs, but they were not reaching legal size.

The participants agree on the following scenarios:

The rise in the combined index suggests that 2016 catches may be increased compared to 2015:

1) An increase in catches greater than 20% could lead to a high harvesting intensity and would increase the effect of expected lower recruitment.
2) An increase no greater than 20% would be unlikely to lead to an excessively high harvesting intensity and would moderate the effect of expected lower recruitment.
3) A lower increase or the status quo could lead to the maintenance of a substantial biomass available to the fishery over a longer period of time.

AREAS 16A, 15 AND 12C

Indicators: Area 16A

The TAC increased by 10% between 2014 and 2015 to a peak at 566 t and was reached. The catch rate during the 2015 commercial fishery decreased and was near average. Landings consisted primarily of intermediate-shell crab.

The commercial biomass index reported in the 2015 post-season survey decreased from 2014 levels due to a decline in residual biomass to a low level combined with a decline in recruitment, which was nevertheless well above average. The temperature increase in the deep layer of the Anticosti Channel and the thinning of the cold intermediate water layer may have caused some displacement of crab to shallow waters not sampled by the survey.

The combined index of commercial CPUE and NPUE from the post-season survey decreased in 2015 compared to 2014 and is below average, suggesting that the biomass available to the fishery will be lower in 2016 than in 2015.

The post-season survey indicates a decrease in adolescent crabs ≥ 78 mm from 2011 to 2013 to a value that has since remained stable and slightly below average. This survey suggests there may be a short- or medium-term decrease in recruitment, as also expected in the adjacent areas (16, 12B, 15 and 12C).

- The resource is observed to be moving and distributed on either side of the channel due to the warming of deep waters. In the short term, deep waters in the channels are expected to remain warm or become even warmer.
- Participants suggest taking a closer look at temperature-based crab distribution by gathering temperature data in the post-season survey.

Summary and outlook: Area 16A

Participants comment on the summary and scenarios presented:

- Participants suggest adding a highlight on the decrease in recruitment.
- In the summary, it would also be good to mention the impact of warming deep waters on the changes observed in crab distribution.
- Participants have diverging points of view on the proposed scenarios. In general, the industry finds the proposed decrease of about 25% in the second scenario too severe. Industry participants find that several factors other than the resource could explain the decreased fishery performance, including a three-week delay in the start of the fishing season and an adjustment of the fishing pattern due to the new crab distribution. Normally,

CPUE should be higher, which would reduce the weight of the post-season survey in the combined index.

- The Science representatives find the recruitment situation in this area less favorable than in adjacent areas. They believe that we are on a downward slope and that a decrease of 25% will not maintain the biomass.
- Industry participants point out the lack of coherence among areas, especially in the importance given to the combined index.

Due to this difference of opinions, participants suggest looking at areas 15 and 12C to get a better overview and then coming back to the Area 16A scenarios.

Indicators: Area 15

The TAC remained stable from 2014 to 2015, at a peak of 718 t, and was reached. The commercial fishery catch rate increased slightly in 2015 and was well above average. Landings consisted primarily of intermediate-shell crab.

The commercial biomass index from the post-season survey increased slightly from 2014 levels due to slight increases in residual biomass and recruitment. The combined index of commercial CPUE and of NPUE from the post-season survey slightly increased, suggesting that the biomass available to the fishery in 2016 will be the same as or slightly higher than in 2015.

The post-season survey indicates a decrease in adolescent crabs ≥ 78 mm from 2011 to 2013 to a value that has since remained near the average, despite a slight increase in 2015. The results suggest there may be a short- or medium-term decrease in recruitment, as also expected in the adjacent areas (16, 12C, 16A and 14).

The participants do not raise any issues.

Summary and outlook: Area 15

Participants discuss the summary and scenarios presented:

- Some participants think we are being too careful compared to the Area 16 scenarios, which have similar indicators.
- Participants suggest moving the status quo to the third scenario and keeping an increase of no more than 10% in the second scenario.
- It is noted that the choice of scenario is primarily a choice of harvesting strategy. For the "aggressive" scenario, harvesting is more intensive, meaning that it more closely follows the increases and decreases in stock.

Finally, the participants agree on the following scenarios:

The combined index suggests that it is possible to slightly increase 2016 catches compared to 2015:

1) An increase in catches greater than 10% could lead to a high harvesting intensity and would increase the expected biomass decline due to expected lower recruitment.
2) An increase no greater than 10% would be unlikely to lead to an excessively high harvesting intensity and would moderate the effect of expected lower recruitment.
3) The status quo or a decrease in catches could lead to maintenance of a substantial biomass available to the fishery over a longer period of time.

Indicators: Area 12C

The TAC decreased by 10% to 317 t between 2014 and 2015 and was reached. The catch rate during the 2015 commercial fishery was stable and near average. Landings contained a slight majority of intermediate-shell crabs.

The commercial biomass index reported in the post-season survey decreased to low levels due to a decline in recruitment and the stability of the residual biomass. The combined index of commercial CPUE and of NPUE from the post-season survey decreased and is below average, suggesting a decrease in the biomass available to the fishery in 2016 compared to 2015.

The post-season survey indicates a decrease in adolescent crabs ≥ 78 mm from 2010 to 2013 to a value that has since remained near the average, despite a slight increase in 2015. The results suggest there may be a short- or medium-term decrease in recruitment, as also expected in the adjacent areas (12B, 16A, 15 and 14).

The participants do not raise any issues.

Summary and outlook: Area 12C

According to the participants, the scenarios are consistent with the indicators. Participants agreed on the following scenarios:

The drop in the combined index suggests that 2016 catches should decrease compared to 2015:

1) The status quo for catches could lead to a high harvesting intensity and would increase the effect of expected lower recruitment.
2) A 10 to 15% decrease would be unlikely to lead to an excessively high harvesting intensity and would moderate the effect of expected lower recruitment.
3) A decrease greater than 15% could lead to the maintenance of a substantial biomass available to the fishery over a longer period of time.

Return to the summary and outlook for Area 16A

The discussion on Area 16A continues:

- It appears clear that the displacement of the resource due to warming waters affected catches.
- Participants also note that the post-season survey may not sufficiently cover the new crab range. There is a lot of uncertainty surrounding the survey, and this should be taken into account.
- After reviewing the adjacent areas and considering the above-mentioned points, participants suggest and agree upon a 15 to 20% decrease for the moderate scenario.

Participants agree upon the following scenarios:

The uncertainty linked to the crab's range during the post-season survey provides a rationale for increasing the weighting of the commercial biomass indicator during the fishery (catch per unit effort or CPUE). However, this indicator suggests that 2016 catches should decrease compared to 2015:

1) A decrease in catches of less than 15% could lead to a high harvesting intensity and would increase the effect of expected lower recruitment.

2) A 15 to 20% decrease would be unlikely to lead to an excessively high harvesting intensity and would moderate the effect of expected lower recruitment.

3) A greater decrease could help maintain a substantial biomass available to the fishery over a longer period of time.

AREA 14

Indicators: Area 14

The TAC increased by 20% to 726 t between 2014 and 2015 and was reached. The commercial fishery catch rate increased slightly in 2015 and is at the highest value in the series. Landings consisted primarily of intermediate-shell crab.

The commercial biomass index reported in the post-season survey decreased due to a significant decline in recruitment and despite an increase in the residual biomass. The combined index of commercial CPUE and of NPUE from the post-season survey slightly decreased but remains very high, suggesting that the biomass available to the fishery in 2016 will be high, but slightly lower than in 2015.

The post-season survey shows a decrease in the abundance of adolescents ≥ 78 mm since 2013, suggesting that there may be a short- or medium-term decrease in recruitment, as also expected in the adjacent areas (15, 13, and 12C).

The participants do not raise any issues.

Summary and outlook: Area 14

Participants discuss the summary and scenarios presented:

- In the highlight on the catch rate, it should be mentioned that this is the highest value in the series.
- In the second scenario, participants decide to keep only the status quo instead of the status quo and a 10% decrease.
- In the future, it may be appropriate to set a ceiling for the increase in catches in the first scenario.
- Several participants disagree with the use of the term "aggressive scenario." They note that in the last assessment, the following terms were used: intensive scenario, intermediate scenario, and careful scenario.

Finally, the participants agree on the following scenarios:

The combined indicator declined slightly but remains very high, suggesting that catches in 2016 could be maintained at the 2015 level:

1) An increase in catches could lead to a high harvesting intensity and would increase the effect of expected lower recruitment.

2) The status quo would be unlikely to lead to an excessively high harvesting intensity and would moderate the effect of expected lower recruitment.

3) A decrease in catches could help maintain a substantial biomass available to the fishery over a longer period of time.

RESEARCH IDENTIFICATION AND PRIORITIZATION

Regarding research priorities, the objectives of the points raised in this assessment are to:

- Increase the coverage of the trawl survey in areas 15 and 16
- Finish the fishing experiments comparing small and large traps so large traps can be used in areas 15, 16A and 12C
- Reconfirm overflow areas by marking crabs during the post-season survey
- Revise the post-season survey protocol to better sample shallower waters, where crabs are now found due to the warming of deeper waters
- Review the calculation of the combined index in Area 13, in particular the weighting of different indicators
- Ensure that trap volumes are correctly taken into account in the standardization of the CPUE (volume effect)
- Gather temperature data during the post-season survey and take a closer look at temperature-based crab distribution
- Continue to develop a precautionary approach
- Continue with Snow Crab habitat mapping
- Represent the distribution of information from the Vessel Monitoring System (VMS) geospatially
- Discuss the influence of temperature on growth and size at terminal moult in the advice
- Present an overall map of fishing effort in the advice

APPENDIX 1- TERMS OF REFERENCE

ASSESSMENT OF THE ESTUARY AND NORTHERN GULF OF ST. LAWRENCE SNOW CRAB STOCK

Regional Peer Review – Quebec Region

February 16 and 17, 2016
Mont-Joli, Québec

Chairperson : Denis Chabot

Context

The snow crab fishery in the Estuary and the northern Gulf of St. Lawrence began in the late 1960s. Landings have varied depending on the adjusted Total Allowable Catches (TACs) based on the recruitment waves and troughs. In 2014, landings have totaled 9,919 t, up from 2013.

The Estuary and northern Gulf of St. Lawrence are divided into nine management areas (13 to 17, 16A, 12A, 12B and 12C). The effort is controlled by a fishing season and catches are limited by quotas. The legal size is 95 mm.

The resource is assessed each year to determine whether changes that have occurred in the stock status necessitate adjustments to the conservation approach and management plan.

Objectives

Provide scientific advice to determine TACs for the snow crab stocks in the Estuary and northern Gulf of St. Lawrence: management units 13 to 17, 16A, 12A, 12B and 12C for the 2016 fishing season. The advice shall include:

- Description of the biology of the snow crab in the Estuary and northern Gulf of St. Lawrence;
- Description of the fishery including landings, fishing effort, carapace condition, size structure and mean carapace width for males;
- Analysis of catches per unit effort from the fishery;
- Analysis of data from post-season trap surveys conducted annually in collaboration with fishers. Indicators: number per unit of effort (NPUE) of legal-size and sub-legal-size crabs, mean carapace width for males and spermatheca load;
- Analysis of data from trawl survey(s) conducted annually in certain sectors or areas. Indicators: abundance index of legal-size and sub-legal-size males, size structure and maturity of both males and females;
- Identification and prioritization of research projects to be considered for the future;
- Perspectives and/or recommendations on management measures in effect for the 2016 fishing seasons, among others, harvest levels and their possible effects on the abundance and maintenance of the reproductive potential, based on a summary table of main indicators for the precautionary approach and short- and medium-term predictions.

Expected Publications

- Science Advisory Report on snow crab of the Estuary and Northern Gulf of St. Lawrence;
- CSAS Proceedings summarizing the discussion.

Participation

- Fisheries and Oceans Canada (DFO) (Science, and Ecosystems and Fisheries Management sectors)
- Fishing industry
- Provincial representatives
- Aboriginal Communities / Organizations

APPENDIX 2- LIST OF PARTICIPANTS

Nom	Affiliation
Boucher, André*	Industrie
Boucher, Jean-René*	Industrie
Bourassa, Luc	Biologiste consultant
Bourdages, Hugo	MPO Sciences
Bourdages, Yan*	Industrie
Brulotte, Sylvie*	MPO Sciences
Bruneau, Benoît*	MPO Sciences
Calderon, Isabel	MPO Gestion des pêches
Collier, Frank	Industrie
Chabot, Denis	MPO Sciences
Chevalier, Jody (tel)**	Industrie
Cloutier, Yvan*	Industrie
Cyr, Charley	MPO Sciences
Dallaire, Jean-Paul	MPO Sciences
Doucet, Marc*	Industrie
Dubé, Pierre*	Industrie
Duguay, Guy*	Industrie
Gauthier, Johanne*	MPO Sciences
Gauthier, Sylvain*	Industrie
Gilbert, Michel*	MPO Sciences
Girard, Mathieu*	Industrie
Gosselin, Claude*	Industrie
Joncas, Jean-Richard (tel)**	Industrie
Jones, Neal (tel)**	Industrie
Hardy, Magalie*	MPO Gestion des pêches
Hurtubise, Sylvain	MPO Sciences
Jerome, Adam*	AGHAMM
Lambert, Jean	MPO Sciences
Lambert, Yvan	MPO Sciences
Landry René	Industrie
Langelier, Serge	Industrie
Lavallée, Dean**	Industrie
Légaré, Benoît*	MPO Sciences
Le Mer, Charline*	MPO Sciences
Léonard, Pierre*	Industrie
Marquis, Marie-Claude	MPO Sciences
Monger, Marc	Industrie
Morin, Bernard	MPO Gestion des pêches
Morneau, Renée	MPO Sciences
Nadeau, Paul	Industrie
Pinette, Majoric*	Industrie
Sainte-Marie, Bernard	MPO Sciences
Stubbert, Curtis	Industrie
Thibeault, Sébastien*	Industrie
Trottier, Steve*	MPO Sciences
Vigneault, Guy*	Industrie

* the first day only
** the second day only